March 1999

The AGATE Flier

Information on developing technologies for business and personal transportation aircraft

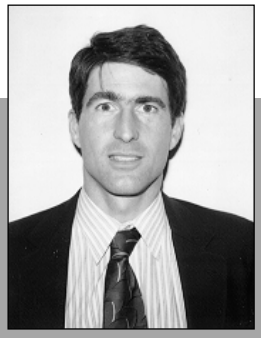
Volume V, Issue 1

National General Aviation Roadmap Approved

At the October 9, 1998 Conference on Turning Goals into Reality, held at Lewis Research Center, the NASA and FAA administrators unveiled a plan that lays the groundwork for the future of general aviation (GA) in the United States. The plan, known as the National GA Roadmap, was approved by the NASA Aero-Space Enterprise Executive Board, which includes all Aeronautic Center Directors and the Associate Administrator.

The National GA Roadmap is a comprehensive 25-year plan for the establishment of a Small Aircraft Transportation System (SATS). Dr. Bruce J. Holmes, NASA General Aviation Program Office Manager, defined a SATS as "an intermodal, personal, rapid transit, air travel system." The Roadmap emphasizes the vigorous creation and initiation of SATS aircraft and airport/facility technologies during the early 21st Century. The plan's major objective is to "enable doorstep-to-destination travel at four times the speed of highways to 25 percent of the Nation's suburban, rural, and remote communities in 10 years and more than 90 percent in 25 years." This means providing access to aerial transportation in hard to reach locales across the country and developing small aircraft that will surpass automobiles in intercity transportation capability and performance.

The Roadmap vision stresses the use of up to 5,400 public airports that are to be designated as SATS airports. These facilities will be outfitted with sophisticated flight communication and weather tracking equipment designed to support flights of SATS aircraft. SATS aircraft "employ new avionics, airframe, pilot training, and engine technologies derived from current investments on the Roadmap." As stated in the Roadmap, "These new aircraft technologies create new features and capabilities that significantly improve affordability, safety, and ease-of-use for single-engine, single-pilot, transportation lightplanes."



John Gallman
Chairman, AGATE Executive Council

"The series of investments described in the National GA Roadmap clearly recognizes GA as a valuable part of our transportation system and defines a significant role for a small aircraft transportation system."

Roadmap investments will be made in both SATS aircraft and SATS infrastructure technologies through public-private partnerships. Investments in SATS aircraft technologies are expected to be completed by 2001 as the AGATE and General Aviation Propulsion (GAP) programs wind down, with investments in SATS infrastructure technologies continuing

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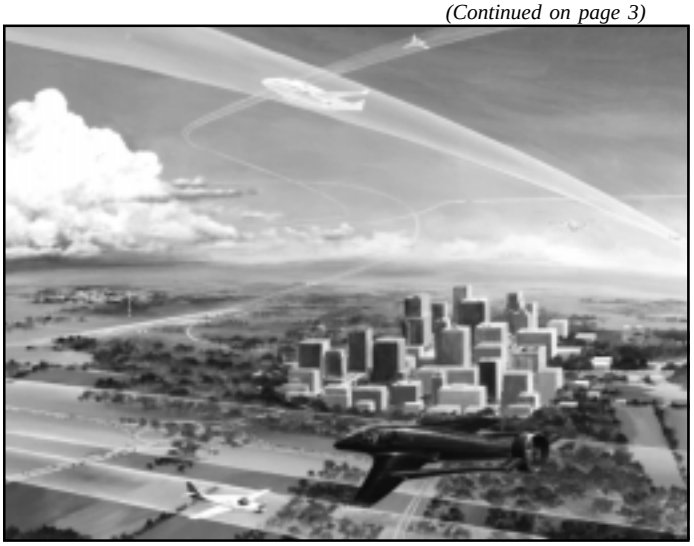
The National GA Roadmap outlines the strategy for the creation of a series of Small Aircraft Transportation System (SATS) airports throughout the United States.



The National GA Roadmap calls for the development of advanced GA technologies that will help to make the "Highway in the Sky" concept a reality.

From the desk of the Program Manager

Dr. Bruce J. Holmes, NASA Langley Research Center

The countdown is on. The AGATE program ends in September 2001, less than 29 months from the date of this publication. What comes next? Who is involved? What happens to the AGATE Alliance?

NASA Administrator Dan Goldin has established the "roadmapping" process as the strategic planning mechanism within the agency. The National General Aviation Roadmap is one of 10 Aero-Space Enterprise roadmaps. The GA Roadmap is focused on the goal *"to enable doorstep-to-destination travel at four times the speed of highways, to 25% of the nation's suburban, rural, and remote communities in 10 years and over 90% in 25 years."*

This long-term goal provides the strategic framework for government investments in a Small Aircraft Transportation System (SATS) to serve the burgeoning travel demand of American citizens in the early years of the 21st century. The Roadmap sets a national goal for coordinated investments by both the public and private sector in the "public good." The "public good" metrics are established by the Administration and Congress and implemented as public policy in the form of federal budgets. For NASA, the DOT, and FAA, the "public good" metrics include mobility, accessibility, safety, airspace capacity, security, noise, and emissions for the nation's air transportation system.

The Roadmap has prepared us for one of the most significant steps that we must take. That step is to negotiate the transition from General Aviation as we know it today, toward tomorrow's SATS. Several converging forces are fundamentally re-shaping transportation demand characteristics as we move into the first decade of the 21st century, including the following trends and forces:

- Transportation demand will outpace supply early in the 21st century. This trend results from the U.S. rural migration of population and jobs, telecommuting, and Baby Boom effect, all shaping 21st century transportation demand. The current mitigation plans for highway gridlock and hub-spoke saturation will not easily satisfy future transportation consumer demand.
- Time is the scarce commodity in the Information Age. Therefore speed is the premium commodity, specifically doorstep-to-destination speed. The revolution in digital bandwidth is the motive force behind the emergence of human/intellectual capacity, displacing physical capacity, in the creation of wealth and jobs. Thus, time and speed will be the motive forces of the Information Age.
- Enabling technologies set the stage for a SATS. These advancements include the AGATE and GAP vehicle technologies (propulsion, avionics, airframe, and training) as well as evolutionary infrastructure technologies ("Smart" airports, Free Flight in Classes C, D, E, and G underutilized airspace).

What comes next?

To date, Roadmap investments have been focused on vehicle technologies associated with revitalizing the U.S. General Aviation industry. With completion of the aircraft technology investments in the next 29 months, the question is, "What comes next?" The next logical step on the Roadmap involves planning for investments in the infrastructure as well as vehicle technologies beyond GAP and AGATE. Together, these investments create the basis for a SATS. The near-term products of these investments include: (1) The emergence of a new generation of safe, affordable, and easy-to-use transportation lightplanes; and (2) The potential for increased National Airspace System (NAS) capacity, through expanded utility of general aviation aircraft, smaller airports and underutilized Classes C, D, E, and G airspace in the NAS infrastructure.

The objective of SATS is to benefit suburban, rural, and remote consumers and improve access to the Hub-Spoke system. These benefits will accrue to "Enriched-"/"Mini-Spoke" capabilities for smaller and more remote airports and communities. In addition, SATS Free Flight will unencumber congested airspace. The nature of these objectives makes the State and Local airport owners, the FAA, and the traveling public the stakeholders in the investments.

A SATS is defined as an intermodal, personal, rapid transit, air travel system. The SATS concept of operations utilizes small aircraft for personal and business transportation, point-to-point direct travel between smaller regional, reliever, general aviation and other landing facilities, including heliports. The SATS would operate within the NAS infrastructure, specifically between about 5,400 public-use landing facilities.

The public good impacts of a SATS occur at four levels—national, regional/state, community/airport, and personal/business. The anticipated public benefits accrue from revolutionized mobility for citizens traveling throughout the Nation and accessibility for vastly more of the nation's communities. In addition, anticipated benefits accrue in safety, cost, airspace efficiency (or throughput), and environmental effects of the Nation's intermodal transportation system. States and regions would benefit from reduced economic disparities due to accessibility improvements. SATS operating capabilities will also benefit and serve the needs of small cargo providers, public service aviation, law enforcement, and emergency medical services. Current investments in SATS vehicle technologies are producing significant improvements in affordability, safety, and convenience or ease-of-use for transportation lightplanes.

The major elements of the SATS vision are:

- Infrastructure: The SATS architecture contemplates landing facilities that would be upgraded to provide near-all-weather

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GA Roadmap Approved

(Continued from page 1)

well into the 21st Century under the follow-on SATS program. NASA and the FAA are also making plans to introduce technologies that will support the concept of free flight in a SATS.

The adoption of a SATS for transportation purposes promises to provide the public with several advantages. Dr. Holmes' paper "NASA Aeronautics Enterprise National General Aviation Roadmap for Pillar II 'Revolutionary Leaps' Goal #7" presented at the National Research Council Transportation Research Board Annual Meeting stated "The emergence of a Small Aircraft Transportation System that utilizes the Nation's currently underutilized airspace and airports would contribute substantially to the Throughput Goal of 'tripling the aviation system throughput, in all weather conditions, within 10 years, while maintaining safety,' while enabling the General Aviation goal. The resulting effect could have significant favorable impacts to the cost, efficiency, and safety for the National Airspace System (NAS), as well as to the mobility and accessibility for America's travelers. In addition, SATS can create potential for larger load factors, and therefore profitability, for existing hub-spoke scheduled service providers through the increased accessibility."

According to Dr. Holmes, as stated in his National Academy of Sciences/National Research Council Transportation Research Board news article on a Small Aircraft Transportation System Concept,

"The four levels of SATS benefits include:

- National.– (1) National impact of SATS on the vitality of the U.S. economic competitiveness; (2) The impact of a SATS on mobility, accessibility, cost, environmental compatibility, and efficiency of the overall National intermodal transportation system; (3) The effects of a SATS on mitigation of pressure for growth of the existing air and ground infrastructure; (4) Effects of a SATS on land use and land value; (5) SATS impact on the cost and efficacy of Federal disaster relief, emergency, and public aviation services; and (6) The SATS impact on the nation's standard of living and quality of life.
- Regional/State.–The Regional/State-level public sector impacts and requirements include state policies, laws, regulations and funding related to development and deployment of a SATS. As a minimum, the impact analysis shall address the following elements: (1) Effects of a SATS on regional and local intermodal transportation system planning; (2) Effects of a SATS on state and local disaster relief, emergency, and public aviation services; and (3) The effects of a SATS on economic disparities within states.
- Community/Airport.–The Community/Airport-level public sector impacts and requirements include local policies, laws, regulations and funding related to development and deployment of a SATS. As a minimum, the impact analysis shall address the following elements: (1) The effects of a SATS for on- and off-airport local economic development opportunities; (2) The effects of a SATS on environmental compatibility of expanded air transportation for smaller communities; and (3) The economic impact of a SATS from local airport utilization changes.
- Personal/Business.– The personal- and business-level public sector impacts and requirements include the individual and corporate social, cultural, and economic issues related to development and deployment of a SATS. As a minimum, the impact analysis shall address the following elements: (1) The effects of a SATS on individual business expansion and efficiencies; and (2) The effects of a SATS on core and extended family quality of life and standard of living."

Plans are being made to establish a federal-state-local partnership to handle policy requirements for a SATS infrastructure. These requirements include: (1) coordinating the National GA Roadmap main objective with federal transportation authorities and the FAA; (2) developing the criteria for identification of prospective SATS airports; (3) establishing standards for national SATS airport ownership; (4) evaluating funding issues for SATS airports; (5) developing a national standard for SATS State Aviation System Planning; (6) expanding the definition of the Airport Compliance Program (ACP) to include a SATS; (7) exploring standards for obligations of SATS airport sponsors; (8) exploring the establishment of SATS Airport Minimum Standards; (9) developing appropriate policy and standards for Commercial Aeronautical Activities, responsive to the national strategic infrastructure nature of SATS facilities; (10) establishing national noise and curfew standards for a SATS; (11) developing standards and procedures for measuring NAS access metrics; and (12) developing a strategy for public education, awareness, and training for SATS users.

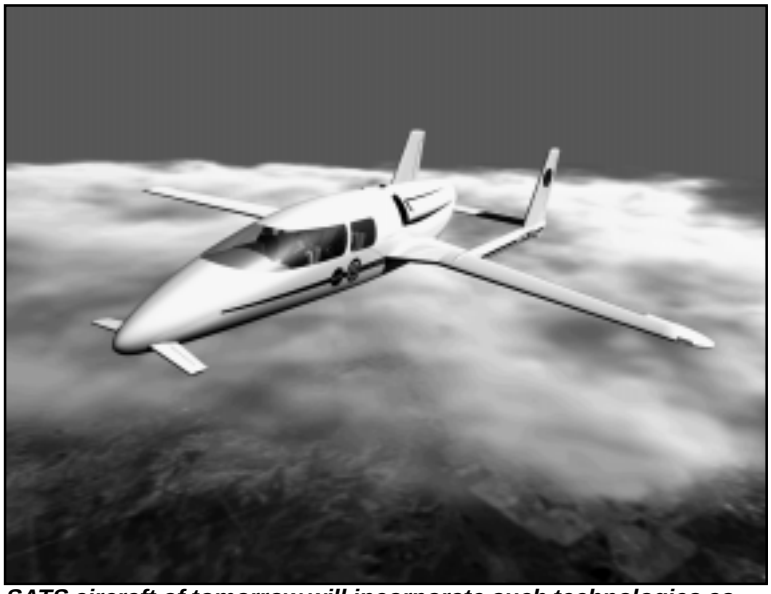
The National Research Council is in the process of preparing a SATS study designed to identify persuasive factors that will cause people to use personal air transportation in the next century and to provide guidance to NASA and other federal and state government partners concerning SATS planning. NASA is also forming a SATS Blue Team, led by Dr. Holmes, to develop a program plan for review this fall. Government and industry will be invited to participate in the program planning conferences and workshops during the coming months.

SATS aircraft and infrastructure technologies will be discussed indepth in the following two articles.□

Small Aircraft Transportation System Aircraft Technologies Lead Way to Future Flight

The National GA Roadmap encourages the vigorous creation and initiation of Small Aircraft Transportation System (SATS) aircraft technologies during the early 21st Century. The objective is to complete deployment of the first generation SATS vehicle technologies (fixed wing and rotorcraft) to recapture the "current market" at 10,000 new aircraft deliveries per year by 2007. The specific technical objectives encompass:

- Integrated flight systems for aircraft including simplified controls and display systems for "electronic Visual Flight Rules" operating capabilities. This includes introduction of the Highway in the Sky (HITS) graphical flightpath operating system. A HITS system consists of a Primary Flight Display (PFD) with a flight pathway depiction, and a Multi-Function Display (MFD) that will provide intuitive situational awareness and supporting information sufficient to enable a pilot to perform safely with reduced work load. The PFD is designed to present easily interpreted technical information in a graphical format, along with the MFD presentation of position, navigation, terrain, weather, and air traffic information. The HITS system is the "high priority" item within the AGATE program to revitalize general aviation. Development of a certifiable HITS cockpit display system has been accelerated by the adoption of a competitive tasking management approach. The HITS system and its certification is scheduled for completion by the fiscal year 2001. Other integrated flight systems and operational features to be introduced are decoupled controls, envelope protection, ride quality, enhanced/synthetic vision,and VDL Mode 3 data radios.
- Propulsion systems including ever more affordable and quieter propellers, more efficient piston engines, single-lever power controls to reduce pilot workload, and small turbine engines such as the FJX-2 lightweight high bypass ratio turbofan engine developed under the NASA General Aviation Propulsion (GAP) program.
- Integrated composite crashworthy airframe systems including automotive manufacturing synergies.
- Unified Instrument-Private pilot training including further reductions in the time and cost for pilot training and proficiency through use of an onboard cyber-tutor and InterNet training.
- Ice protection and operations for true near-all-weather safe utility, including lightning protection.



SATS aircraft of tomorrow will incorporate such technologies as turbine engines developed from the NASA General Aviation Propulsion (GAP) Program.

Example of a HITS system as envisioned by the NASA General Aviation Program Office (GAPO).

SATS aircraft, both piston and turbine engine-powered, are expected to be capable of flight at speeds of at least 200 to 300 knots, making them faster than current GA aircraft. The SATS aircraft will cruise at altitudes of 6,000 to 25,000 feet and at average ranges of 800 to 1,200 miles. These low-cost aircraft are anticipated to rival the automobile for day trips in excess of 300 miles.

Second generation SATS aircraft technology objectives focusing on the "latent market" and slated for completion by the year 2017 will encompass: (1) affordable, certifiable software; (2) synthetic/enhanced vision with simplified controls and training; (3) automotive synergies in manufacturing; and (4) quiet, non-hydrocarbon propulsion. □

SATS Infrastructure Technologies to Provide Enhanced Flight Operations Capability

In addition to stressing the creation and application of SATS aircraft technologies, the National GA Roadmap calls for the introduction of SATS infrastructure technologies that promise to enhance flight operations capability during the early 21st Century. The objective is to complete deployment of the first generation SATS infrastructure technologies to support recapturing the "current market" of 10,000 new aircraft deliveries annually by the year 2007. The specific technical objective encompasses the creation of National Airspace System (NAS) infrastructure technologies for SATS airports and heliports to achieve accessibility, safety, cost, and efficiency objectives. The technical elements will include:

- "Smart" airports equipped with Mini-LAAS (Local Area Augmentation System) GPS navigation, Datalink Flight Information Services (FIS), Traffic Information Services (TIS), and airport databus/CIS standards. Helping to develop these services will be a ground station, located at the NASA Langley Research Center in Hampton, Virginia, that will comprise a Datalink Infrastructure Facility (DIF). AGATE is establishing this first ground station to develop systems technologies and procedures for General Aviation (GA) compatible with those of commercial air carrier and cargo aircraft in the future Air Traffic Management (ATM) System. This ground station is being implemented at NASA Langley to provide an experimental flight test setting for use by the Government and industry. The ground station at Langley, along with additional ground stations, will serve as a network of prototype ground stations, or initial test sites, needed to support the AGATE program.
- EnRoute and terminal free flight procedures at non-towered non-radar airports.

photo courtesy of Harris Corporation

A Harris Corporation Datalink Infrastructure Facility (DIF) Operator's Console.

The DIF ground stations will incorporate various advanced datalink communications, navigation, and surveillance (CNS) systems not typically available in the current ATM System. These CNS systems will include: (1) FIS—Broadcast via VHF Datalink VDL Mode 2 Broadcast, (2) Controller Pilot Data Link Communications (CPDLC) and digital voice via VDL Mode 2 and Mode 3 two-way datalink, (3) Automatic Dependent Surveillance-Broadcast (ADS-B) via 1090 Mhz squitter, and (4) a "Low cost" Differential Global Positioning System (DGPS) using VDL Mode 3 datalink. Systems engineering for the ground stations is being undertaken by the Research Triangle Institute, with the system components and station console being provided by Harris Corporation, NavRadio Corporation, and Rockwell-Collins Commercial Avionics. "The DIF will provide the mechanism to evaluate avionics related products and operational concepts being developed in the AGATE program, and the means to acquire baseline and long-term data necessary to define the design guidelines, systems standards and certification methods (GS&Cs) for the new products and procedures being developed," said Dan DiCarlo, AGATE Integration Platforms Work Package Leader.

Planning for the establishment of a network of ground stations has been directed towards meeting the growing need for a suitable data acquisition range. Sites along the East Coast region have been selected by AGATE in order to incorporate two major NASA facilities, planned FAA projects, and participation by various localities recommended by the Commonwealth of Virginia. "After establishing the first ground station at Langley, future expansion is planned to provide continuous signal coverage between Langley and the NASA Wallops Flight Test Facility with eventual extension of the test range to the FAA's Hughes Technical Center in Atlantic City, New Jersey, and other sites, as locations and funding sources are identified. Anticipated participation by the FAA and the use of remote facility tielines will allow linkage of AGATE flights, originating at Langley, with controllers in Air Traffic Control (ATC) labs in Atlantic City for study of real time pilot/controller communications," DiCarlo said. □

Message from the Director of the AGATE Alliance Association, Inc.

Jack Sheehan

The AGATE Alliance Association is a very unique organization. The diversity of the members and their interests create an environment where we can truly accomplish things together that no one member could possibly accomplish alone. This unique aspect of the alliance seems to be the catalyst for our continued growth. The interest in membership in the alliance is higher now than at any time in the past. We have accomplished a great deal and have produced some significant breakthroughs. The challenge we now face in each of the work packages is determining the value of our individual and collective investments and weighing that against the value of new member participation. The closed architecture school of thought was the prominent one when we started this experiment. Many encouraged a more open environment and the results have been rewarding. We need to continue to look toward the idea of open environments but also to protect each member's interest. There is some degree of inherent shelf life in our technology and having a proprietary piece of technology is of no value unless it is incorporated in a product that reaches the market. I believe it will be important in the coming year to find those areas where we can leverage the technology with new members, and to determine, in the case of a required investment on their part, where to invest the funds received.

A significant finding during our survey entitled *A Collaboration in Progress* was the fact that one of the highest rated responses was the overwhelming agreement that "The value of the collaborative alliance went beyond the government participation and funding". We are taking some bold initiatives along those lines. These have included the public release of data, the initial agreement to exchange data with the rotorcraft industry and the competitive tasking within the alliance requiring much greater industry contribution. These initiatives combined with the admission of suppliers to a work package indicate a true maturing of the collaborative process.

We are now exploring new initiatives in which the alliance would actively participate role in the determination of technology requirements for the Small Aircraft Transportation System. We are also considering the formation of member-funded work packages and are working on the details for a FY00 start (October 99). The member-funded work packages could be the logical extension of work packages that have completed their AGATE objectives and funding but whose members wish to continue to collaborate, or the establishment of new work packages with different subject matter.

The business of the alliance continues to grow and the AGATE Alliance Association is finding new ways to serve the membership. We recently set up the opportunity for some of our members to talk with the U.S. Air Force Flying Clubs strategic steering committee about the future of aircraft with AGATE technology and how the clubs might either retrofit their aircraft or consider new aircraft and also utilize the new training products.

World's First SATS Airport Designated

The world's first SATS airport was officially designated at the Virginia Aviation Board meeting on Oct. 28, 1998. Manassas Regional Airport was chosen for its location and modern facilities. It is also Virginia's busiest general aviation airport with 130,000 operations per year and 350 based aircraft—the most in the state. Requirements for airports under SATS include accessibility, the availability of reliable aeronautical services, and intermodal connectivity.

"Virginia's airports come pretty close to meeting the requirements of SATS goals," Virginia Department of Aviation Director Ken Wiegand said. "The challenges as I see them are the increased demand for land and infrastructure to accommodate SATS and precision GPS instrument approaches to all runway ends, as well as the provision of reliable modern services and issues relating to intermodal connectivity at individual airports." Bruce Lawson, Airport Manager at Manassas, called the designation exciting "With our proximity to the nation's capital, FAA and NASA and funding sources for research and development, members of Congress and their staff understand the impacts upon the national transportation system."

"The Manassas Regional Airport already has the kind of surface environment (runways, taxiways, lighting, etc.) and aeronautical service providers that one would think of when identifying a modern, full-service airport. It also has a ground-based precision instrument approach, automated weather reporting equipment, automated weather dissemination and flight planning equipment (Weathermation), a full range of excellent aeronautical services, and uncommon ground transportation choices to include rental car availability on the field, crew cars, taxi service, a direct link to Interstate 66, unique and convenient rail service to the District of Columbia via the Virginia Railway Express from a rail station situated on the airport," said Wiegand.

"Manassas represents a convenient site for testing and demonstration. Most importantly, Manassas is among 68 licensed, public-use airports in Virginia that are eligible to receive funding and technical assistance from one of the most progressive state aviation agencies in the country. Future Virginia SATS airports will provide a range of infrastructure and services from the very basic to those mirroring those at Manassas," he said.

"As time goes on, we look forward to working with NASA's General Aviation and Commuter Program to introduce other Virginia airports to the SATS system. Future plans to implement emerging aviation technologies in Virginia include upgrades to the existing AWOS and ASOS, weather dissemination equipment, communications equipment, and the ARNAV WeatherNet system. We are also considering the installation of a Differential GPS approach somewhere in Virginia and, of course, we are always looking for new and exciting aviation technologies to introduce to our system users," added Wiegand. □

We are trying to do something new this year at the Spring "Sun 'n' Fun" meetings by having the meeting hosted by Embry-Riddle Aeronautical University and also by interspersing the plenary session with some interesting presentations from the foreign market and new technology issues. □

"Live Shot" Offers Media a Glimpse of Latest GA Aircraft

The first two airplanes to make extensive use of AGATE technology were featured in a successful series of NASA television "Live Shot" interviews via satellite February 12, 1999 at the NASA Langley Research Center. A NASA single-day record of 28 television stations around the country interviewed Bruce Holmes as he sat in a Cirrus SR20, with a Lancair Columbia 300 filling the rest of the frame. As AGATE director and manager of NASA's General Aviation Program Office, Dr. Holmes talked with news and morning show reporters on the theme of "Putting Wings on America." Another 20 stations used NASA-provided video to cover the story. The event was attended by 60 invited guests which included dignitaries from throughout the state of Virginia.

AGATE technologies utilized in the aircraft designs include spin resistant wings, recovery parachutes, and advanced composite materials. The Columbia 300 and SR20 are to serve as Small Aircraft Transportation System (SATS) type airplanes.

The dignitaries who attended the "Live Shot" at Langley included the Virginia Secretary of Commerce and Trade, Barry E. DuVal who expressed an interest in SATS for Virginia as well as the state's utilization of manufacturing technology for the SATS program. These statements were echoed by James Eason, the former mayor of the city of Hampton and president of the Hampton Roads Partnership.

"Virginia has become a leader in economic development in the last five years. One important component of Virginia's business success is the ability of organizations to be efficiently and effectively connected to the outside world. Virginia's transportation system provides that connectivity. An important part of business success is moving people and products through general aviation. Virginia's commitment to technology in improving its airports will result in even more competitiveness for the business community. Moreover, NASA Langley Research Center, located in Virginia, positions the Commonwealth to take advantage of technology and new applications for general aviation research, development, maintenance, and manufacturing within the aerospace industry," said DuVal. "It is critical we maintain a strong NASA presence in Virginia."

Virginia Department of Aviation Director Ken Wiegand also took the occasion to speak about SATS technology in Virginia. "Virginia was the first state to realize the importance of emerging technologies and their impact on AGATE as well as our airport infrastructure. When we were introduced to ARNAV's WeatherNet datalink system, we immediately realized the value of having the system working for us in Virginia. We saw the value of weather graphics and weather text information in the cockpit as well as having the capability to communicate outside of radio voice capabilities. We especially saw the value of being able to track our equipped aircraft as they traveled around the Commonwealth or out of state where the system was active. The safety enhancement of having weather graphics in the cockpit and the flight following alone sold us on the value of the system to our operation which includes transporting the Commonwealth's First Family and VIPs around the country, but primarily in Virginia," he said.

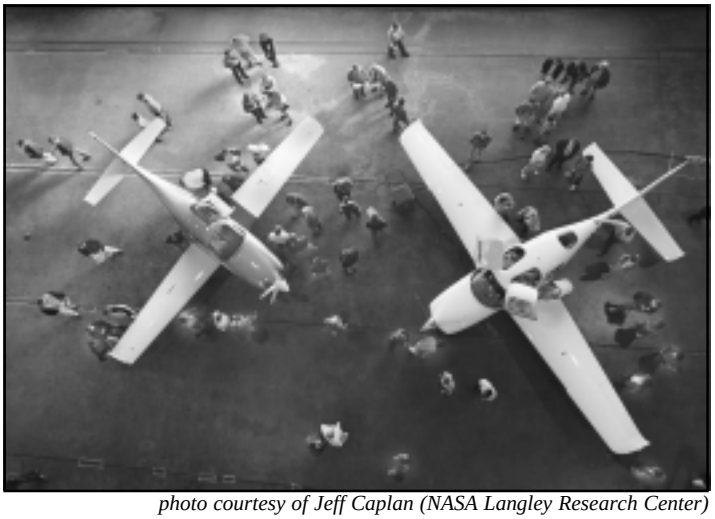


photo courtesy of Jeff Caplan (NASA Langley Research Center)

The Lancair Columbia 300, left, and Cirrus Design SR20 represent the latest GA aircraft designs and are to serve as SATS type airplanes.

"Virginia was also the first state to designate a SATS airport at Manassas, Virginia. Manassas Regional Airport is one of the most active General Aviation facilities on the East Coast and in Virginia. Manassas is a high-end, model SATS facility that will be considered for the application of emerging technologies as they become available," said Wiegand.

Other guests included: Arthur Collins, Hampton Roads Planning District Commission; James R. Smith, Peninsula Airport Commission; James W. Holley, III, Mayor of the City of Portsmouth; Michael Montgomery, Executive Director of the Peninsula Alliance for Economic Development; Dorothy Buchanin, FAA Technical Center; and Shirley J. Ybarra, Secretary of Transportation, Commonwealth of Virginia.□

Schedule of Events

April 5-9, 1999:
Lakeland, FL
EAA "Sun 'n' Fun" Fly-In

April 6-8, 1999:
Daytona Beach, FL
Technical Council Meetings

April 9, 1999:
Daytona Beach, FL
AGATE Executive Council Meeting and All Member Plenary

April 20-21, 1999:
Phoenix, AZ
NATA

April 20-22, 1999:
Phoenix, AZ
FAA Forecasting Conference

June 21-24, 1999:
NASA Langley Research Center
Hampton, VA
Small Aircraft Transportation System Planning Conference

July 28-August 5, 1999:
Oshkosh, WI
EAA AirVenture '99
- *Oshkosh Technical Council Meetings*
- *NASA-FAA General Aviation Technology Press Event*
- *National General Aviation Design Competition Awards*

1998 Phase I and II SBIR/STTR Awards Announced

Phase I and II award winners for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer Research (STTR) programs have been announced by NASA. The SBIR and STTR programs are playing a major role in the efforts to revitalize general aviation (GA). Awards provided to small businesses and research institutions are leading to significant technology development efforts. Many of these are being conducted by AGATE members. The awards are competitive and the winners are selected on the basis of their value to GA revitalization through potential commercialization of their innovative technology. Past GA SBIR/STTR winners have had a strong commercialization track record. Since 1993, NASA has awarded GA companies over $32M in these programs.

In 1998 the GA Phase I and II SBIR and STTR Phase II award winners and their project titles are as follows:

SBIR Phase I Awards (1998)

***Seagull Technology, Inc.**
Universal Aviation Data Service (UADS)

Vision Micro Design Inc.
Low Cost Design & Manufacturing of GA Cockpit Displays using Projection LCDs

*** Mod Works**
Advanced Low Cost Airframe Construction Techniques

Zerad Inc.
A Vent Control for Optimizing Airbag Performance

Aqualytic Technologies
Catalytic Ignition System

***Global Aircraft Corporation**
A Novel Rotary Diesel Engine for General Aviation Aircraft

SIETEC Corporation
Compression Ignition Engine for Light Aircraft

SBIR Phase II Awards (1997)

***AvroTec, Inc.**
Innovative Affordable Head-Mounted General Aviation Pilot Information System

Team Vision
Integrated Design and Manufacturing Software Tool for Windows

Mide Technology Corporation
Piezoelectric Ignition and Sensing Device

STTR Phase II Awards (1997)

Alpha Star Research Corp. and Clarkson University
Progressive Fracture Simulation for Design of Braided Ceramic Combustors for Turbine Engines

***Global Aircraft Corporation and *Research Triangle Institute**
Design and Implementation of an Integrated Landing System for Small General Aviation Airplanes

The 1998 Phase II awards up to $600,000 each will be made upon completion of the ongoing Phase I work, expected by December 1999. Solicitations for 1999 SBIR Phase I proposals open April 24, 1999 and close on July 14, 1999. Selections for 1999 SBIR Phase I awards up to $70,000 each will be made in October 1999.

More information can be found on the internet at http://sbir.gsfc.nasa.gov. □

***AGATE Member**

AAAI photo

Mod Works Human Factors Engineered Instrument Panel developed with Florida Institute of Technology under the NASA STTR program.

AAAI photo

Seemann's Composites Cirrus SR20 Fuselage manufactured with the SCRIMP™ Low Cost Manufacturing Process under the NASA SBIR program.

Management and Technical Progress Highlights

Flight Systems

The AGATE Flight Systems Work Package hosted a technical meeting with the Flight Training Curriculum Work Package on February 25-26, 1999 in Hampton, Virginia. Over 25 consortium members from government, industry, and academia were in attendance. Additionally, representatives from the Aviation Safety Program, Synthetic Vision Element, and human factors experts from the NASA Crew/Vehicle Integration branch attended the meeting. The Flight Systems Work Package is developing affordable flight systems that allow near all weather flying capability for light GA airplanes, including a "Highway-in-the-Sky" operating capability. The Flight Training Curriculum Work Package is developing and validating advanced training methods that take advantage of these emerging technologies. The AGATE flight systems test vehicle, a modified Beechcraft Bonanza, was made available (in cooperation with Raytheon Aircraft, an AGATE partner) for viewing. This test vehicle (identified as AGATE 1-B) is available to NASA researchers interested in a low-cost flight test solution for experiments in single-pilot flight deck, decoupled flight controls, display safety, human factors, and related experiments.

Integrated Design and Manufacturing

The Integrated Design and Manufacturing (ID&M) Work Package reported that AGATE and the Rotorcraft Industry Technology Alliance (RITA) met at NIAR (the National Institute for Aviation Research) on February 3, 1999 to review the business issues associated with data sharing. John Tomblin reviewed the AGATE Materials Research Program. A short discussion followed in which the financial details of the two programs were compared. The AGATE research represents $0.7 M/yr that is matched 1:1 by industry. The total RITA program is funded ($9M/yr) and is also matched 1:1 by industry. These funds support 60 projects, 20 of which are in composites. Jack Sheehan and John Ward provided presentations describing the business operations of AGATE and RITA respectively. Paul Masson then led a discussion to determine how to proceed. The group also agreed that their initial effort in the materials area would be followed by other collaborative efforts in other technical areas.

Integration Platforms

Work orders and engineering review requests for the installation of a Datalink Infrastructure Facility (DIF), located in the NASA Langley Research Center Mission Control Center (MCC), are being processed. Due to re-negotiation of the current in-house support contract, no additional work is being accepted by the current contractor with work requests sent out of house for bids. Initial engineering review estimated major structural enhancement needed at the catwalk site where some of the DIF hardware is to be located. This has delayed support for the installation, as alternate solutions to minimize impact of such a requirement are being addressed. FY '99 funding to complete the installation and support the development of approach profiles and other operational procedures needed for the DIF has been resolved, with completion of the basic system at NASA Langley targeted for April 30, 1999.

Flight Training Curriculum

Four students have completed training in the Unified Curriculum and are awaiting the FAA check Private/Instrument check ride.

The ICIS STT training module has been integrated and tested. The system has been deployed to Embry-Riddle. The CBT module has been completed and tested. A draft analysis of the results has been completed and is under review.

The Primary Flight Display (PFD) for the PFD learning module has been defined for training purposes and agreed to by the Flight Systems Work Package. The testing scenario and test design have been completed.

Program Analysis

The Program Analysis Work Package reported that 27,576 users have been on the program analysis Internet site. These visitors have spent an average of 8:18 minutes exploring the site and have accessed 153,707 page views for an average of approximately 5.6 page views per visitor.

The visitors have completed 3,675 surveys and 1,198 of the survey respondents have requested more information on either learning how to fly or on purchasing an airplane.

The Work Package reported that the number of identifiable International Users who visit the site remained relatively constant at 9.21 percent of the total traffic. The number of United States visitors is 59.03 percent with 31.75 percent of the visitors not identified.

AGATE ALLIANCE MEMBERSHIP

Work Packages: Flight Systems (FS)
Propulsion Sensors & Controls (PS&C)
Integrated Design & Manuufacturing (ID&M)
Ice Protection Systems (IPS)
AGATE Integration Platforms (AIP)
Flight Training Curricula (FTC)
Systems Assurance (SA)
Program Management (PM)

Work Package Membership: P = Principal; A = Associate

Official Organization Name	FS WP-1	PS&C WP-2	ID&M WP-3	IPS WP-4	AIP WP-5	FTC WP-6	SA WP-11	PM WP-12
Advanced Creations Incorporated						P		P
Airborne Research Associates	A							
Allied Signal Aerospace Company	P		P				P	
ARINC Incorporated	P							
ARNAV Systems Incorporated	P							
Aurora Flight Sciences		A						
AvroTec Incorporated	P						P	P
BFGoodrich Aerospace				P				
Cessna Aircraft Company	P	P	P	P		P		P
Cirrus Design Corporation			P				P	
Cox and Company Incorporated				P				
Digital Equipment Corp.	P							
Embry-Riddle Aeronautical Univ.			A			P	A	
Global Aircraft Corp.			P				P	
Harris Corporation	P							
Hartzell Propeller Company			P					
Honeywell Technology Center		P						P
Innovative Dynamics Incorporated				P				
Jeppesen Sanderson Incorporated	P					P		
Lancair International Incorporated			P					
Mod Works Incorporated			P					
NavRadio Corporation	P							
Ohio State University						P		
Raytheon Aircraft Company	P		P		P	P		P
Raytheon E-Systems		P					P	
Rockwell Collins Incorporated	P						P	
Seagull Technology Incorporated	A							
Simula Technologies Incorporated			P					
Stoddard-Hamilton Aircraft Incorporated			P					
Teledyne Continental Motors		P						
Textron Lycoming		P						
Unison Industries		P						
United Technologies Hamilton Standard			P	P				
Wichita State University-NIAR			A	A			A	A

SUPPORTING MEMBERS

A&P Technology, Inc.
Aerocar Llc.
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AOPA-Air Safety Foundation
Avidyne Incorporated
Executive Jet Incorporated
Experimental Aircraft Association (EAA)
General Aviation Manufacturers Association (GAMA)
Georgia Tech Research Institute
Kansas State University
Micro Craft Incorporated
Mississippi State University-Raspet Research Lab
Mitre Corporation
National Air Transportation Association (NATA)
National Center for Atmospheric Research
New Piper Aircraft Incorporated
Optimal Solutions Incorporated
Research Triangle Institute
University of Illinois at Urbana-Champaign
University of Kansas
University of Tennessee Space Institute
University Research Foundation
Williams International
Wyndemere Incorporated

GOVERNMENT PARTNERS

Federal Aviation Administration
NASA Langley Research Center
NASA Lewis Research Center
USAF Research Laboratories (Wright Directorate)

From the desk of the Program Manager

(Continued from page 2)

utility and minimize user uncertainty regarding destination services. "Smart" airports with higher utility and safety in more weather conditions would be included, along with free flight procedures for expanded NAS capacity, and airport utility.

• Vehicles: The aircraft will be predominantly GAP-powered AGATE planes, incorporating state-of-the-art advancements in avionics, airframes, engines and pilot training and capable of operating in free flight modes within the evolving NAS. These aircraft will possess revolutionized vehicle safety, affordability, maintainability, environmental compatibility, and ease-of-use.

• Users: Simplified and affordable pilot training through advanced technologies, enabling pilots to maintain all necessary competencies and proficiencies for AGATE Highway in the Sky system flight operations, within the practical constraints imposed by typical professional and personal time schedules.

Who is involved? The follow-on to AGATE and GAP is planned to be the SATS Program. NASA, the FAA, industry, and universities will all play vital roles in the continued technology development. There will be a few new players involved as well. The States will play a key role in infrastructure technologies development and deployment. In addition, the National Research Council's Transportation Research Board will become engaged in evaluating the SATS concept and public sector requirements. Finally, the role of the FAA will become more clearly defined as the Mission Need Statement (MNS) that is under development for SATS matures.

The FAA Administrator commissioned an MNS development project for the SATS. The MNS documents the shortfalls in agency mission capabilities for the SATS. The MNS process initiates all major investment planning by the FAA. The MNS is planned for completion as early as the spring of 1999.

The NRC is planning a SATS study to evaluate trends and forces that shape 21st century demand for higher-speed personal air transportation and provide guidance to NASA, as well as other federal and state government partners, for SATS investment and partnership planning. The NRC SATS Committee will plan to complete their consensus report by about the end of 2000.

What happens to the AGATE Alliance? AGATE and GAP have taught the General Aviation public and private sectors how strategic alliances and partnerships are designed and operated. The development and deployment of SATS infrastructure technologies will require an innovative federal-state-local government partnership mechanism. The lessons learned during the past six years will be valuable.

At the completion of the AGATE program in 2001, the industry and government partners must make a pivotal choice in how to continue. Both the government and the industry have a stake in continuing partnership. NASA will look to industry leadership for vehicle technology investment strategies and partnerships. The federal government will likely continue to take a strong leadership role as managing partner for infrastructure technology investments. Under industry leadership, the AGATE Alliance has the potential to play a more lasting role in SATS.

The goal of a federal-state-local partnership would be to establish the national requirements and planning templates for an interstate system of smaller airports for the SATS. The strategic premise for the partnership would be to "treat the nation's public use airports as a national economic strategic infrastructure (like highways & public utilities)." The products of this partnership would include the means for development and deployment of SATS operating capabilities.

In conclusion, the Roadmap strategy holds that the ingredients for a significant advancement in transportation are present. Specifically, the most significant innovation in doorstep-to-destination speed since the emergence of the hub-spoke airways system is possible, if the challenges can be met for making small aircraft and airports more available to the traveling public. The transportation innovation would take the form of a SATS for personal and business travel. The National General Aviation Roadmap establishes the vision and goal metrics for a SATS, to contribute to satisfying these burgeoning transportation demands of the 21st Century.

The AGATE membership has remained steady and the budget continues to be stable. The 1998 partner commitments to date include 36 Principal, 4 Associate, 20 Supporting, and 3 Government Members. These are the partners and programs committed to achieving world class R&T capacity for the U.S. general aviation lightplane industry, in support of creation of the Small Aircraft Transportation System. □

Contents:

The AGATE Flier

Volume V, Issue 1 March 1999

The AGATE Flier is published by the AGATE Alliance Association, Inc., a private, non-profit, membership organization founded to stimulate the development and dissemination of general aviation technology. ***The AGATE Flier*** reports on progress in a family of technology initiative and public/private aviation related activities to revitalize the U.S. GA industry, called AGATE—Advanced General Aviation Transport Experiments. The NASA Langley Research Center is the lead center for this program.

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GAPO Plans Expanded GA Display at Oshkosh AirVenture '99

NASA is planning an expanded display for AirVenture '99 showcasing the latest advancements in General Aviation Technolgy. The centerpiece of the display will be the newly certified Cirrus SR20, and Lancair Columbia 300 aircraft. A new animated video called "The Small Aircraft Transportation System (SATS) Flight Immersion Experience" will be presented in a theatre within the display area and will demonstrate flight as experienced from inside the cockpit of an AGATE airplane. The Theatre has three screens, showing front and peripheral views from within the aircraft. This year's display will also feature a flight simulator from Embry-Riddle Aeronautical (ERAU).

"We are planning to change the basic format of the display from one based on programs (which is a logical layout for a NASA or Industry person) to one based on product, to provide the most logical flow to the general public," said Hank Jarrett, Deputy Manager of NASA's General Aviation Program Office. "Even the name of the building is being changed to reflect this. The display building is now being referred to as the NASA GA Building."

The principal areas for presentation at this year's display are: (1) the new aircraft displays, (2) Propulsion Systems, (3) Cockpit Displays, (4) Flight Training, and (5) Material and Processes, and (6) SATS Infrastructure.

Specific displays in each area have not been finalized and members are encouraged to make proposals for displays within their respective areas. The Theatre will be available for conventional video displays (other than the "SATS Flight Immersion Experience") and additional video proposals will be entertained.

The AGATE Flier

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Address correction requested